U.S. Fish and Wildlife Service

Polar Bear Program Annual Report: A Summary of 2017 Activities

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Introduction

Polar bears occur in 19 subpopulations in Canada, Greenland, Norway, Russia and the United States. The U.S. is in the range of two polar bear subpopulations: the Chukchi Sea (also referred to as the "Alaska-Chukotka" subpopulation) and the Southern Beaufort Sea subpopulation.

The U.S. Fish and Wildlife Service (Service) has primary management responsibility for polar bears in Alaska. The Service's conservation activities are largely mandated by the Marine Mammal Protection Act (MMPA) and by the Endangered Species Act (ESA). The U.S. is also a member of international treaties and agreements calling for coordinated polar bear conservation with other circumpolar nations.

The goals of the Service's Polar Bear Program are to:

1. Secure the long-term persistence of wild polar bears as a species and as a significant functioning element in the ecosystem of which they are a part;

2. Secure the long-term persistence of polar bears at scales that represent the genetic, behavioral, life-history, and ecological diversity of the species;

3. Secure the long-term persistence of the two polar bear subpopulations in the United States (the Southern Beaufort Sea and Chukchi Sea subpopulations);

4. Recognize the nutritional and cultural needs of Native peoples with connections to polar bear populations, including the opportunity for continued harvest of polar bears;

5. Continue to manage human-bear interactions to ensure human safety and to conserve polar bears; and

6. Achieve polar bear conservation while minimizing restrictions to other activities within the range of the polar bear, including economic development.

These fundamental goals express the intentions of the 2016 Polar Bear Conservation Management Plan (CMP)[1] and guide the Service's polar bear management, research, monitoring, and communication work. The fundamental goals reflect the input and aspirations of stakeholders closely connected with polar bears and their habitat, including the State of Alaska, the North Slope Borough, Alaska Native peoples, conservation groups, and the oil and gas industry. The fundamental goals also address our statutory obligations under the MMPA and the ESA.

This report is intended to provide the reader with a brief summary of polar bear conservation activities in Alaska. Additional information and resources can also be found on the Polar Bear Program website at www.fws.gov/alaska/fisheries/mmm/polarbear/pbmain.htm.

[1] The Polar Bear Conservation Management Plan can be found online at: (https://www.fws.gov/alaska/PDFs/PBRT%20Recovery%20Plan%20Book.pdf)

Conservation Management Plan

Polar bears have been federally managed under the Marine Mammal Protection Act (MMPA) since 1972. The Service listed polar bears as threatened throughout their range under the Endangered Species Act (ESA) in 2008, due to observed and projected declines in their sea-ice habitat associated with climate change (73 FR 28212). Both polar bear population size and range are projected to decrease in the foreseeable future. After the listing, the Service convened a Polar Bear Recovery Team to develop a Conservation Management Plan (CMP) for polar bears to help guide management and research activities, focusing on actions needed to conserve and recover polar bear subpopulations that occur in the U.S.

In January 2017, after opportunity for public comment, the CMP was finalized by the Service, The CMP identifies primary threats to polar bears and high priority conservation and recovery actions that can help promote the survival of the species, including:

- Limit global atmospheric levels of greenhouse gases to levels appropriate for supporting polar bear recovery and conservation, primarily by reducing greenhouse gas emissions
- Support international conservation efforts through the Range States relationships
- Manage human-bear conflicts
- Collaboratively manage subsistence harvest
- Protect denning habitat
- Minimize risks of contamination from spills
- Conduct strategic monitoring and research

In 2018, the Service plans to convene a team to coordinate implementation of the CMP with our stakeholders closely connected with polar bears and their habitat, including the State of Alaska, the North Slope Borough, Alaska Native peoples, conservation groups, and the oil and gas industry. The Implementation Team will consist of an Executive Committee that will provide overall guidance on implementation, and three working groups to address the following: 1) science and Traditional Ecological Knowledge (TEK)– including research and monitoring; 2) communications; and 3) human-polar bear conflicts. For more information, please contact James Wilder.

Harvest Management Framework

In Alaska, polar bears may be legally harvested for subsistence and handicraft purposes by coastal dwelling Alaska Natives, as long as the harvest is not wasteful. Hunting for sport or commercial purposes is prohibited. Aircraft, poisons, traps, snares, and large motorized vehicles cannot be used to harvest polar bears. In addition, harvest of polar bears from the Chukchi Sea subpopulation must comply with the terms of the U.S Russia-Bilateral Agreement, as described below.

U.S Russia-Bilateral Agreement

Polar bear subsistence harvest in the Chukchi Sea subpopulation is managed jointly by the U.S. and Russia under the *U.S.-Russia Bilateral Agreement on the Conservation of the Alaska-Chukotka Polar Bear Population* (*U.S.-Russia Bilateral Agreement*). The *U.S.-Russia Bilateral Agreement*, signed in 2000 by government representatives of the U.S. and Russia, identifies goals to improve polar bear conservation, and to safeguard the cultural and traditional use of polar bears by Native peoples. Under the *U.S.-Russia Bilateral Agreement* it is prohibited to take females with cubs and polar bears in dens. The *U.S.-Russia Bilateral Agreement* established a four-member Commission (hereafter the Commission), consisting of a federal and Native representative from each country, who are responsible for management decisions including the identification of a sustainable subsistence harvest limit, and the implementation and enforcement of this limit. To assist in carrying out its tasks, the Commission formed a Scientific Working Group (SWG) which provides recommendations to the Commission.

As mentioned, one of the primary purposes of the *U.S.-Russia Bilateral Agreement* is to allow for continued opportunities for Native peoples in Alaska and Russia to harvest polar bears for subsistence and cultural purposes. Under this treaty, the Commissioners are required to meet annually to review new harvest and population information and agree on a sustainable harvest limit. Since 2010, the Commission has identified a sustainable harvest limit for the Alaska-Chukotka (AC) polar bear population during its annual meetings. It is illegal to take any polar bear in violation of any annual taking limit, or other restriction on the taking of polar bears, that is adopted by the Commission.

In December 2017, the Commission held a virtual meeting and voted that the harvest limit remain unchanged from the previous level: a total of 58 polar bears, split evenly between the two countries, with no more than one third of those consisting of female bears. In western Alaska, this means that the current harvest limit is 29 bears per year, of which no more than 9 bears can be females. Polar bears which are killed in defense of life, or die as a result of research or other direct human activity, will also be included in the harvest limit.

The U.S. has committed to full implementation of the harvest limit no later than 2020. As mentioned above, the quota was first agreed to by the Commissioners in 2010 and we have been working towards full implementation since that time.

The U.S. Marine Mammal Protection Act states that the harvest limit is in effect once agreed to by the Commissioners. The USFWS's preferred method to implement the harvest limit is through local and regional management supported by federal regulations, along with close coordination with our polar bear co-management partner.

In 2016, the process to identify a successor organization to the ANC got underway, with assistance from the Indigenous Peoples Council on Marine Mammals, Kawerak, North Slope Borough, Maniilaq and others (see Co-Management section below). In November 2017 a new co-management organization, the Alaska Nannut Co-Management Council (ANCC), formed.

Ultimately, we expect enforcement of the harvest limit to take effect in January 2020; until then, reporting of polar bear harvest in communities that are part of the *U.S.-Russia Bilateral*

Agreement will continue as currently managed by the Service's Marking, Tagging, and Reporting Program. Hunters must continue to report and tag harvested polar bears within 30 days with their local tagger. The USFWS is developing a document, in collaboration with the ANCC, for hunters and communities affected by the *U.S.-Russia Bilateral Agreement* titled "Questions and Answers About Polar Bear Management in the Bering and Chukchi Seas Region Under the U.S.-Russia Agreement."

The SWG is currently working to develop an updated harvest risk assessment, based on analysis of new population information that has been collected since 2008 from the AC polar bear subpopulation. The SWG's goal is to draft a report for the Commissioners prior to the next Commission meeting, expected to occur in July 2018. The SWG is also currently working to develop an updated model for estimating the boundary between the AC and Southern Beaufort Sea (SBS) subpopulations to help inform harvest management decisions under the *U.S.-Russia Bilateral Agreement*. The work is being led by researchers at Colorado State University, with the goal that the updated model and results will be available at the 2018 Commission meeting. For more information, please contact James Wilder.

Inupiat-Inuvialuit Agreement

For the SBS subpopulation, the subsistence harvest of polar bears is managed voluntarily by Alaska Natives in the U.S. under a user-to-user agreement, the *Inuvialuit-Inupiat Polar Bear Management Agreement in the Southern Beaufort Sea* (*I-I Agreement*), which was signed in 1988 by the Inuvialuit Game Council of Canada, and the North Slope Borough Fish and Game Management Committee of Alaska. The *I-I Agreement* provides for harvest monitoring and annual quotas, and protection of family groups and denning bears. A Joint Commission was established to implement the *I-I Agreement*, as well as a Technical Advisory Committee, consisting of research and management biologists from agencies in the U.S. and Canada, who collect and evaluate scientific data to share with the Joint Commission. The Joint Commission and technical advisors meet annually to exchange information.

The Service participates on the Technical Advisory Committee and, provides updated polar bear research and management information to the Joint Commission. During its annual meeting in August 2017 in Utqiaġvik, Alaska, the Joint Commission reiterated that their top priority for research is to get an updated, reliable population estimate for the SBS polar bear subpopulation, and provided several other recommendations regarding future research and management. Additionally, no changes to the current subsistence harvest quota were made during the 2017 meeting.

The current subsistence harvest quota for the SBS remains at 56 bears total: 35 for the United States and 21 for Canada.

Polar Bear Mortality

In cooperation with a variety of partners, the Service monitors natural and human-caused forms of polar bear mortality; this information is critical to understanding population status and health of polar bears in Alaska, as well as for sustainably managing Alaska Native subsistence harvest.

In 2017, a total of 29 human-caused polar bear mortalities were reported (Table 1). This includes 26 bears killed for subsistence purposes (including struck and lost) from three communities, and three polar bears killed in defense of life (Tables 1, 2). Reported human-caused mortalities in 2016 totaled 34 bears, including 30 harvested for subsistence purposes from eight villages, and four bears killed in defense of life. Additional reports for bears harvested in 2017 are expected to be submitted and will be reported in the 2018 annual report.

The number and types of reported human-caused polar bear mortality from 2008 to 2017 are shown in Table 1. Of the 420 bears reported as removed, 259 bears were reported as male, 80 as female, and the sex was reported as unknown or was not reported for 81 bears. The majority of mortalities occurred in spring (March, April, and May) (Figure 1). In addition to the 420 reported bear mortalities from human causes, five bears were reported with unknown cause of death and nine bears were reported as having died from natural causes from 2008 to 2017.

Reported annual polar bear harvest by Alaska Natives averaged 38 bears for the period from 2007 to 2016 (Figure 2), and ranged from 14 bears (in 2015) to 82 bears (in 2012). Increased tagging compliance would help ensure that the terms of the *U.S.-Russia Bilateral* and *I-I Agreements* are met. For more information, please contact Brad Benter or Bridget Crokus.

Table 1. Number and type of reported human-caused polar bear mortalities and removals from wild (orphaned cubs) in Alaska, 2008-2017.

	Year										
Removal Type	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**TOTAL**
Subsistence	39	26	24	59	79	55	22	14	30	24	372
Struck and Lost	0	0	1	0	3	1	2	0	0	2	9
Defense of Life (by Native Alaskan)	1	4	3	2	2	6	0	2	4	3	27
Defense of Life (by non-Native Alaskan)	0	0	0	0	0	0	2	0	0	0	2
Unknown, Human-caused	0	0	0	0	2	0	0	1	0	0	3
Euthanized	1	0	0	0	0	0	0	0	0	0	1
Industry	0	0	0	1	2	0	0	0	0	0	3
Research Mortality	0	1	0	0	0	0	0	0	0	0	1
Removal from Wild*	0	0	0	1	0	1	0	0	0	0	2
TOTAL	**41**	**31**	**28**	**63**	**88**	**63**	**26**	**17**	**34**	**29**	**420**

* Orphaned cubs removed from the wild and placed in zoos for public education.

Table 2. Reported polar bear harvest in Alaska by Alaska Natives, by community, 2016-2017.

	Polar Bears Harvested* (Number)			
Community	**Female**	**Male**	**Unknown**	**Total**
2016				
Barrow	2	7	0	9
Gambell	0	2	0	2
Kaktovik	1	0	0	1
Little Diomede	0	2	0	2
Nuiqsut	0	0	2	2
Point Hope	1	6	0	7
Shishmaref	0	1	0	1
Wainwright	1	4	1	6
Total	**5**	**22**	**3**	**30**
Percent	**17**	**73**	**10**	**N/A**
2017†				
Barrow	0	8	2	10
Little Diomede	1	2	1	4
Point Hope	3	4	**5**	12
Total	**4**	**14**	**8**	**26**
Percent	**15**	**54**	**31**	**N/A**

* Harvest includes struck and lost polar bears.

† Additional harvest reports from 2017 are expected and will be reported in the 2018 annual report.

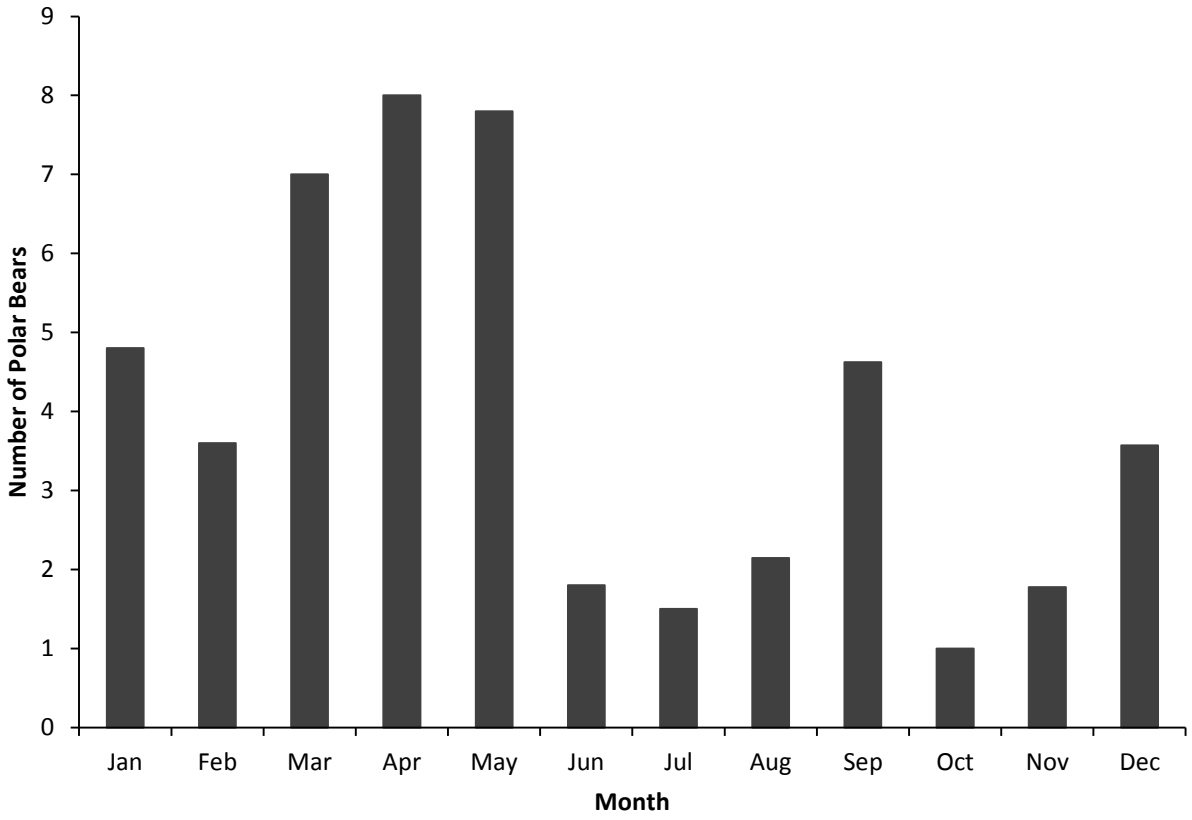


Figure 1. Average reported human-caused polar bear mortality in Alaska, by month, 2008-2017.

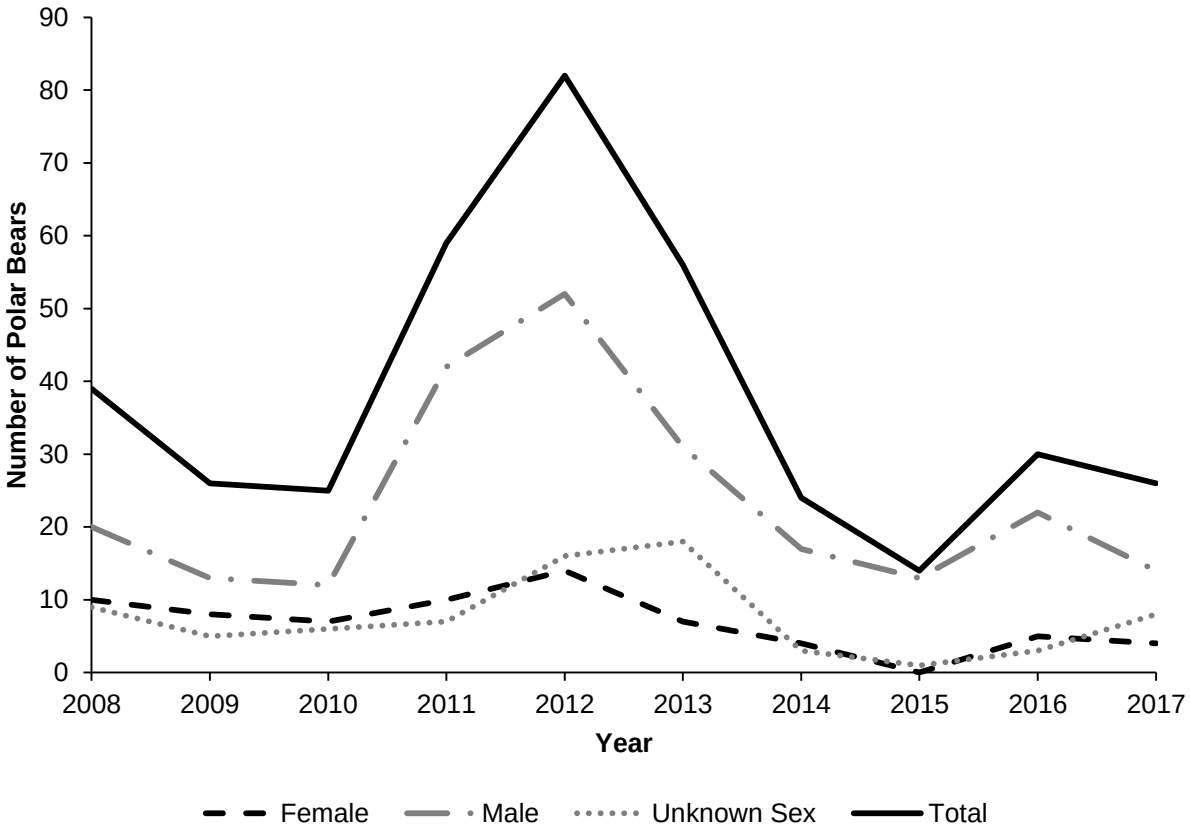


Figure 2. Reported polar bear harvest by Alaska Natives, 2008-2017.

Co-Management

In 2017 the Service entered into a contract with the Indigenous People's Council for Marine Mammals (IPCoMM) to facilitate the formation of a new entity to represent Alaska Native polar bear subsistence hunters that will work cooperatively with the Service to implement various aspects of polar bear research and management, including the *U.S.-Russia Bilateral Agreement*. In November 2017, the Alaska Nannut Co-management Council (Council) was formed to assume the role previously held by the ANC. The Council identified the following 15 villages as members: Brevig Mission, Gambell, Kaktovik, King Island, Kivalina, Kotzebue, Little Diomede, Nuiqsut, Point Hope, Point Lay, Savoonga, Shismaref, Utqiaġvik, Wainwright and Wales. The Council also developed a Constitution that describes its operating procedures, duties, purposes, and membership.

As of January 10, 2018, 14 of 15 Tribal Governments from these villages had passed resolutions to approve the Constitution and join the Council. In 2018, the Council is expected to work with local communities to develop their vision of and plan for local polar bear management, including harvest regulation and monitoring, and management of human-polar bear interactions. The Council is also expected to hold discussions with the Service to identify areas of shared interest which can serve as the components of a Five-Year Co-Management Plan. The Five-Year Co-

Management Plan will also identify roles and responsibilities, clarify expectations for communication, coordination, and collaboration, and identify deliverables/outputs. Finally, a five-year cooperative agreement will be negotiated to provide Service funding, as available, for activities identified in the Five-Year Co-Management Plan. For more information please contact James Wilder.

Research and Monitoring

Fall Coastal Surveys in the Southern Beaufort Sea

Fall coastal surveys for polar bears along the northern Alaskan coastline, between Utqiaġvik, and the Canadian border, were conducted by the Service between 2000 and 2014. The Service and partners recently published a paper in the journal *Biological Conservation* (see Technical Reports and Peer-Reviewed Publications section below) that analyzed these data to determine: estimates of the weekly number of bears on shore across years, what factors influence the distribution and abundance of bears on shore; and how different management options for disposal of bowhead whale remains in Kaktovik, Alaska might affect the number of bears found adjacent to the community. Final results suggest:

- The mean annual number of polar bears onshore between the last week of August and the last week of October, 2000-2014 (except 2006) was 140 (95% C.I.; 127 – 157);
- The number of polar bears on shore each week was strongly related to sea ice conditions; more bears occurred on shore when ice return dates were later;
- Distribution of polar bears on shore was most strongly affected by the presence/absence of a whale carcass(es), the date of sea ice retreat, and the availability of barrier island habitat; and
- The number of polar bears near Kaktovik could ultimately be reduced by nearly 80% if remains of bowhead whale carcasses were moved down the coast away from the community; however, such a move could also result in serious short term human-bear conflicts if polar bears respond by seeking foraging opportunities within the community itself.

There are no plans for a coastal survey in the near future. For more information please contact Ryan Wilson.

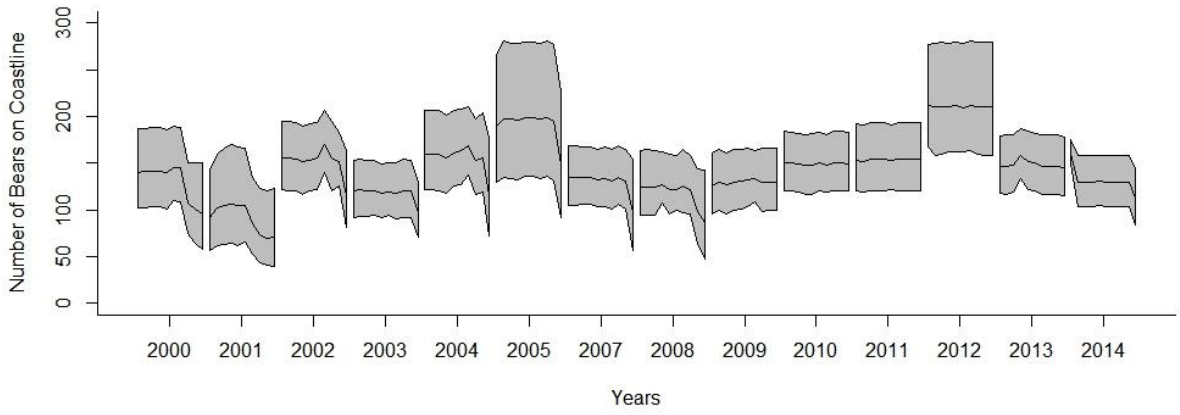


Figure 3. Weekly (late August through late October) abundance estimates of polar bears along the coastline of northern Alaska, from Utqiaġvik to the Canadian border, 2000-2014, excluding 2006.

Chukchi Sea Polar Bear Study

Accurate scientific information is needed for management and conservation of the Chukchi Sea subpopulation of polar bears, which inhabits the Bering, Chukchi, and eastern Siberian seas. The Service and collaborators resumed research on the Chukchi Sea subpopulation in 2008, focusing on nutritional condition, health, and feeding ecology; distribution and habitat use; and population dynamics (e.g., reproductive and survival rates).

In spring 2017, the eighth year of fieldwork for this project, we captured, collected information from, and released 48 polar bears on the sea ice between the communities of Point Hope and Shishmaref from March 21 to April 20. Open water and poor ice conditions ended the field season seven days early. We deployed 13 Global Positioning System and two Iridium satellite system radio collars on adult females, which are designed to drop off after one year. We also deployed five small ear-mounted geolocation tags on adult male bears. Similar to previous observations and published findings, research in 2017 indicated that the offshore area between Point Hope and Shishmaref provides important habitat for the Chukchi Sea polar bear subpopulation.

Using data from this research project, a study describing changes in fasting status of polar bears while on ice in the Chukchi and Beaufort Seas was recently published (see Rode et al. 2017 in Technical Reports and Publications section below). Other analyses are in preparation, including estimates of population abundance and vital rates (see ***Chukchi Sea Demographic Analysis*** section). The Service and its collaborators plan to continue this project in 2018. For more information, please contact Michelle St. Martin.

Adult male polar bear spotted during the field season.

Chukchi Sea Demographic Analysis

Estimates of demographic parameters are required for management and conservation of the Chukchi Sea subpopulation, including identification of a sustainable harvest limit, as called for under the *U.S.-Russia Bilateral Agreement*. The Service, U.S. Geological Survey (USGS), and partners have analyzed data collected from polar bears of the Chukchi Sea subpopulation during the periods 2008-2011, 2013, and 2015-2016. The core data come from 421 physical captures that occurred during springtime in the U.S. portion of the Chukchi Sea region between the Seward and Lisburne peninsulas, as well as movement data from 107 radio-collars and 77 ear-mounted or glue-on satellite tags. Auxiliary data that were analyzed in the same modeling framework include: search effort from helicopter tracklogs, information on whether bears denned successfully (obtained from radio-telemetry data), spring-time weaning status of two-year-olds, and litter size distribution of yearlings.

The goals of the analysis were to estimate abundance and vital rates (e.g., recruitment, survival) and/or related indices for this subpopulation. Challenges included: relatively small sample sizes; the fact that the U.S.-based sampling area did not cover the entire geographic range of the Chukchi Sea subpopulation; and movement of animals in and out of the sampling area within and among years (i.e., temporary emigration). To address these challenges we developed a multi-event, integrated capture-recapture model that was based on the polar bear life cycle and included "un-observable states", which allowed us to model the movement of bears with respect to the sampling area, and thus reduce potential bias in estimated parameters. Density estimates (bears/km^2) were derived for the sampling area and then extrapolated to larger geographic areas of interest (e.g., the management boundaries of the Chukchi Sea subpopulation), based on indices of habitat use derived from resource selection functions. The model was developed using custom software in a Bayesian framework to increase flexibility and allow integration of

multiple data sources, which is not possible using packaged software (e.g., Program MARK).

Estimating abundance is one of the most challenging aspects of wildlife research, and the results of this analysis are characterized by large uncertainty and caveats. Nonetheless, it represents the first quantitative estimates of demographic parameters for the Chukchi Sea subpopulation, derived using methods designed to mitigate the problems associated with previous capture-recapture studies that had a similar sampling design. This work will likely be published in 2018. For more information, please contact Ryan Wilson.

Instrument-Based Aerial Surveys for Ice Seals and Polar Bears

The National Marine Fisheries Service (NMFS), in collaboration with the Service and other partners, conducted instrument-based aerial surveys for ice seals and polar bears in U.S. portions of the Chukchi Sea region in spring 2016. This study did not involve physical capture of animals or rely on direct human observation of marine mammals; rather, data were collected remotely via an array of thermal cameras on which marine mammals show up as "hot spots", and high-resolution digital cameras that can subsequently determine the species of animal.

Surveys consisted of 25 flights totaling 15,720 km (9,768 mi) of search effort in Alaska; concurrent surveys were flown by a Russian research team in Russian portions of the Chukchi Sea region. Images from the thermal-digital camera combination, when processed using automated software, yielded a polar bear detection rate of only 60-65% (lower than expected). Based on previous knowledge of bear density and survey coverage, researchers expected to encounter about ten bears during 2016 survey; however, the on-effort bear count was only three bears. This suggests problems with the thermal/visual detection methods. NMFS is working with partners to determine if changes to survey protocols may address the issue. Until the issue is resolved, NMFS has recommended suspending planning for expanded surveys in the Southern Beaufort Sea. For more information, please contact James Wilder.

Collaborative Polar Bear Studies on Wrangel Island

The Wrangel Island State Nature Reserve in Russia is an important denning area for pregnant polar bears from the Chukchi Sea subpopulation, and provides terrestrial refuge for bears of all age and sex classes during the ice free season. In 2016, the Service initiated a collaborative three-year study to collect observational and genetic data from polar bears on Wrangel Island to better understand body condition, activity levels, number, age and sex composition, reproductive status, and other parameters that will help inform population status.

In September-October 2017, systematic ground-based observation surveys were conducted across Wrangel Island by Russian and American collaborators; genetic samples (hair) were also collected. The largest number of bears (=589) ever recorded on Wrangel Island occurred in 2017; all age and sex classes of polar bears were observed. Most bears were observed to be in good body condition, perhaps as a result of access to walrus haul-outs and whale carcasses which also occur on the island. Field trip reports containing preliminary information are available for 2016 and 2017; the Service plans to continue collaborative work on Wrangel Island in 2018 with the Reserve and the All-Russian Research Institute of Nature Protection to obtain critical

information on the ecology and status of the Chukchi Sea subpopulation. For more information, please contact James Wilder.

Reducing Human-Bear Conflicts

Community-Based Conservation at Kaktovik, Alaska

The Service's Polar Bear Program has been conducting community-based conservation activities at Kaktovik (located on Barter Island) during the fall open water period annually since 2002. The overall goals are to monitor bears that come to shore and aggregate near the community, and to minimize human-bear conflicts. In recent years, growing tourism has resulted in an increasing need for the Service's Arctic National Wildlife Refuge to manage boat-based polar bear viewing on Refuge waters surrounding Kaktovik. In 2017, the Polar Bear Program and Arctic Refuge conducted field work based in Kaktovik from August 22 to October 5, 2017; results are summarized below.

Biological Monitoring. During the core monitoring period (September 7-26) we observed a minimum, maximum, and average of 37, 62 and 45 bears respectively from twice-daily counts. We observed at least nine family groups, two of which had triplet cubs-of-the-year (< 1 year old), and one that had triplet yearlings (1-2 years old). Lone adult male, female, and sub-adult bears were also observed. The multi-year (2002-2017) average daily count of polar bears during the core monitoring period is 31 bears; no definitive trend in abundance is apparent (Figure 4). When body condition could be assessed (e.g., when bears were standing or walking), all bears were rated as being in average or better body condition; we observed no skinny or emaciated bears, and responded to no natural mortality events in 2017.

Recent scientific findings indicate that polar bears in the Beaufort Sea are arriving earlier on shore, increasing their length of stay, and departing later back to sea ice. Our long-term monitoring results corroborate these findings. For example, during the first five years of monitoring (2002-2006), we never observed more than 30 bears during the first week of September. By comparison, in 2012-2017, we observed 30-69 bears at Barter Island during the first week of September in all years except 2015. The increasing presence of polar bears along the Beaufort Sea coastline will require continued collaboration with local residents and workers to optimize both human safety and polar bear conservation.

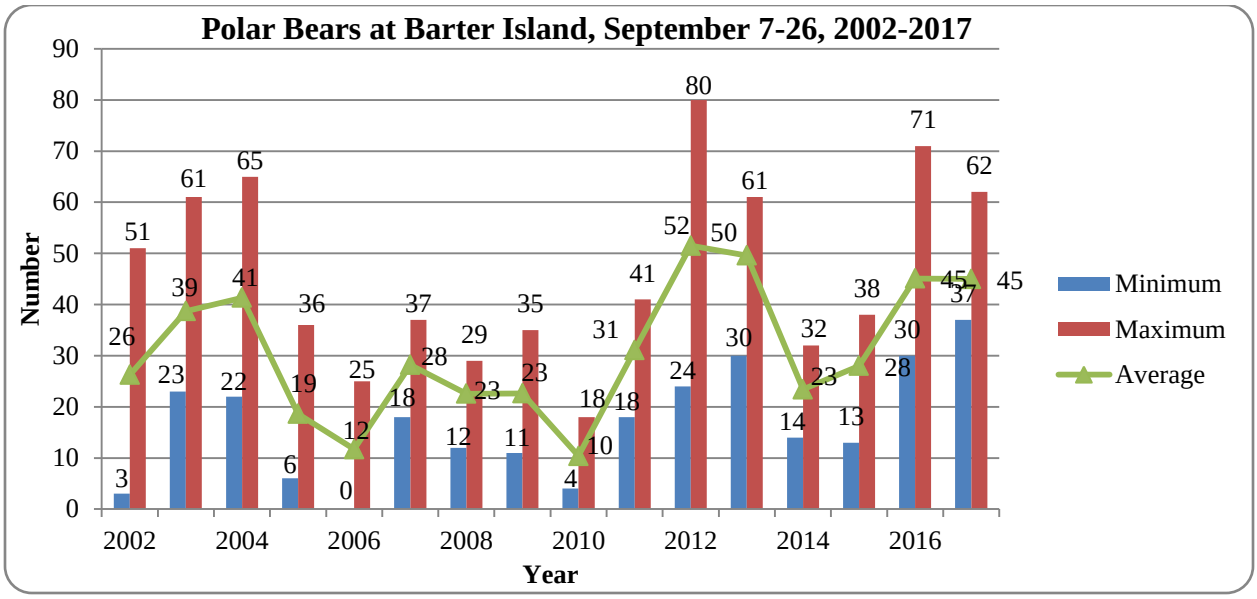


Figure 4. The minimum, maximum, and average number of polar bears observed annually at Barter Island, Alaska, during the core monitoring period of September 7-26, 2002-2017.

Polar Bear Patrols. Since 2010, the Service has provided funding, training assistance, and on-the-ground support to the North Slope Borough's (NSB) Polar Bear Patrol program in Kaktovik. This program involves specially trained local residents who provide a critical safety function for their community and contribute to polar bear conservation by deterring bears from the village using non-lethal methods. Effective patrols helped to ensure that no bears were killed in conflict situations in Kaktovik during 2017.

Attractant Management. One of the Service's goals is to help reduce human-bear conflicts in coastal communities by reducing attractants that may draw bears into town; once bears become food-conditioned, it becomes more difficult to keep them out of town. To help address this issue, four custom-made bear-resistant food storage lockers were provided by Defenders of Wildlife in 2015 to facilitate the storage of locally harvested subsistence foods in a manner that prevents bears from accessing them. After testing the food lockers in 2016, local residents found that the lockers had been extremely effective at preventing bears from obtaining food rewards. In 2017, the Service and Defenders of Wildlife provided funding to construct eight additional food lockers to families that expressed an interest in trying them. The lockers will be delivered in 2018.

Recreational Viewing. Since 2008, polar bear tourism in and around Barter Island has been increasing. Some land-based viewing (from vehicles) occurs on non-Service lands, primarily at the bone pile and along the road system. To address human safety and potential disturbance to polar bears, the Service developed viewing guidelines in cooperation with Kaktovik residents, and encouraged visitors to view polar bears only if accompanied by an experienced guide.

In recent years, a shift occurred where now most viewing occurs from boats on the waters surrounding Kaktovik, which are part of the Service's Arctic National Wildlife Refuge. On Arctic Refuge waters, polar bear viewing is managed via a permit system in which commercial boat operators and guides are required to obtain a special use permit from Arctic Refuge. The permits include operating conditions for avoiding disturbance to bears.

In 2017, eight commercial boat-operating businesses and eleven additional commercial guide companies renewed their commercial use permits for guiding recreational viewers on Arctic Refuge waters surrounding Kaktovik. Because of the rapid growth of this activity, Arctic Refuge has suspended the issuance of additional permits until a more comprehensive, long-term polar bear viewing management strategy can be completed (expected in 2019). To be sustainable over the long term, recreational viewing must avoid disturbance to bears, threats to public safety, and conflicts with local residents. More information about polar bear viewing on Arctic Refuge can be found at www.fws.gov/refuge/arctic/polarbearv.html.

One key aspect of managing polar bear viewing is ensuring that visitors receive polar bear safety and awareness information when they arrive on Barter Island. In 2017, Polar Bear Program staff continued to assist Arctic Refuge during bear season to "meet and greet" all visitors and provide information about polar bears and Arctic Refuge. We also continued to work with the Refuge and community residents to address issues of concern such as commercial filming/photography by large media groups, tourism conflicts with subsistence activities, and potential effects of viewing on polar bears. For more information on community-based conservation activities at Kaktovik, please contact Susi Miller.

One of the primary aspects of polar bear management is addressing issues related to an increasing presence of polar bears (and visitors) around local communities.

Incidental and Intentional Take Program

The MMPA provides allowances for citizens engaged in specified activities, such as oil and gas

exploration, development or production, to seek authorization to incidentally (unintentionally) take small numbers of polar bears. Most "take" resulting under this allowance is limited to short-term changes in bear behavior (e.g., a bear may avoid or investigate an area of industry activity). Under the Incidental Take Program, citizens, or groups such as oil and gas operators, may apply for a Letter of Authorization (LOA), which, if granted, allows for incidental "take" (as defined under the MMPA) of polar bears during authorized activities. Prior to issuance of an LOA, the Service requests companies submit a description of the proposed work, and measures that will be taken to avoid bear encounters. The LOAs include measures to minimize potential impacts to bears; examples include proper management of "attractants" (such as food and garbage) or placement of a "no activity" one-mile buffer around known dens. At present, regulations for incidental take related to oil and gas activities are in effect in the Chukchi Sea region until 2018. New regulations for the Beaufort Sea region were promulgated in August 2016 for a five-year period.

Directed take (also referred to as intentional harassment or deterrence) authorization is requested when bears may need to be deterred from human-use areas. For both incidental and intentional take activities, LOAs include monitoring and reporting requirements. Monitoring and reporting results provide a basis for evaluating current and future impacts of activities on bears. In 2017, the Service issued 13 incidental take LOAs to oil and gas companies for marine, terrestrial and on-ice activities in the Beaufort Sea region. The Service also issued 17 intentional take authorizations for the Beaufort Sea region and one intentional take authorization for the Chukchi Sea region. Monitoring data are not yet available for 2017.

During the most recent seven-year period for which data are complete (2010 to 2016), the oil and gas industry reported a total of 1,582 observations of 2,373 polar bears. Of the 2,373 bears observed, no incidental (disturbance) take of bears were reported for 83.9 percent of the bears (1,978 bears). The oil and gas industry reported take of 395 bears which included both intentional takes by hazing and incidental take by disturbance during the seven year period. For more information, please contact Christopher Putnam.

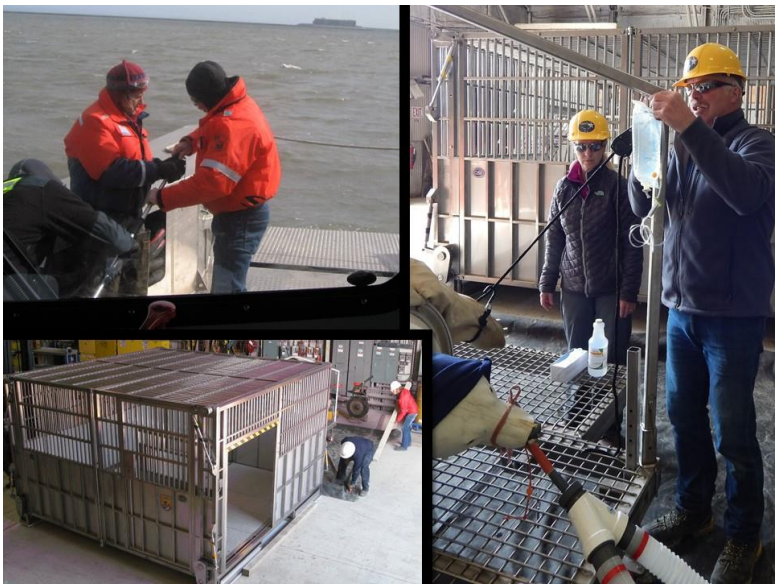
Polar Bear Deterrence Trainings

The Service works with partners to conduct polar bear training programs, such as polar bear awareness and safety, polar bear deterrence, and train-the-trainer programs. In 2017, the Service conducted ten training courses with a total of 89 participants. Sixty-three students attended six polar bear deterrence training courses and 26 students completed four separate train-the-trainer courses. The Service also published a polar bear deterrence train-the-trainer manual in 2016 which is being incorporated into polar bear safety and deterrence trainings, and will help establish a polar bear deterrence training standard for Alaska. The manual is available on-line at https://www.fws.gov/alaska/fisheries/mmm/polarbear/det_training_manual.htm. For more information please contact Christopher Putnam.

Oil Spill Response and Planning

Response Activities. Over the last few years, the Service has been increasing oil spill response capabilities for polar bears in Alaska, in cooperation with several partners. For example, an *Oil Spill Response Plan for Polar Bears in Alaska* was completed in 2015, and specialized equipment such as washing tables, transport cages, and a bear holding module have been constructed. Additionally, an ad hoc marine mammal working group, sponsored by Alaska Clean Seas (the primary organization that responds to oil spills on the North Slope of Alaska), has been formed and meets annually to share information and participate in field response exercises, when feasible.

In July 2017, the Service participated in the annual Mutual Aid Deployment (MAD) drill hosted by Hilcorp Alaska. The purpose of the MAD drill was to practice oil spill emergency response tactics, equipment, and readiness during a field exercise that involved a (mock) underground pipeline burst and subsequent spill into the marine environment. While most of the field response effort centered on primary containment activities, a "polar bear rescue" component was also included as part of the spill scenario. Service staff, in collaboration with some members from the ad hoc marine mammal working group mentioned above (Alaska Clean Seas, the Alaska Zoo, Pet Stop (veterinarians), and industry) developed the field tactics necessary to conduct open water capture of an "oiled" polar bear. The group deployed in two teams: a capture/transport team, and a stabilization/treatment team, and were successful in implementing the boat-based capture of the bear, transporting it to the wildlife facility, and subsequent washing/treatment. The MAD drill allowed polar bear responders to test equipment and work through challenges that arose in each phase of the rescue. The opportunity to integrate a wildlife component into the bigger emergency response structure and practice polar bear-specific response skills in a field setting were valuable contributions toward furthering oil spill readiness in Alaska. For more information, please contact Susi Miller.



Practicing polar bear oil spill response activities along the Beaufort Sea coast of Alaska, 2017. Top left: Wildlife response staff prepare equipment necessary to capture the "bear" that can be seen in the background. Right: Veterinary staff medically stabilize and treat the bear on a specialized washing table. Bottom left: A specialized module is set up to hold the bear until it is ready for release.

Oil Spill Modeling. In 2016, the Service initiated a study to determine the potential effects of oil spills in the Chukchi Sea during autumn. The Service contracted with RPS-ASA to perform spill simulations at four sites in the Chukchi Sea where production may occur in the future. Simulations in the Chukchi Sea allowed for modeling of a worst case underwater "blowout" scenario with a 30-day release of 25,000 barrels/day for a period of 75 days following the spill. Data derived from these models were then used to assess the potential impact to polar bears in the Chukchi Sea. Specifically, we used simulations from two of the four sites (one in in the U.S., and one adjacent to Wrangel Island in Russia; Figure 5) to estimate the proportion of polar bears and the amount of 'high-value' polar bear habitat that might be oiled by these hypothetical spills. We also assessed which coastal areas of the Chukchi Sea would be most likely to receive oiling. Results showed that only a small proportion (1 – 5%) of high-value polar bear sea ice habitat was directly affected by oil sufficient to impact bears. However, 27 – 38% of polar bears in the region were potentially exposed to oil (this would equate to 540-760 bears, assuming a population of 2000 bears). Oil consistently had the highest probability of reaching Wrangel and Herald islands, important areas for polar bear denning and summer terrestrial habitat. Oil did not reach polar bears until approximately three weeks after the spills.

This study was published in the journal *Environmental Pollution* in January 2018 and will be useful for planning how to respond to an oil spill, e.g., how large of a response might be needed, and where resources might be best deployed. The Service plans to continue developing spill simulations for the Beaufort Sea in 2018, albeit with smaller spill scenarios involving existing off shore platforms. For more information, contact Ryan Wilson.

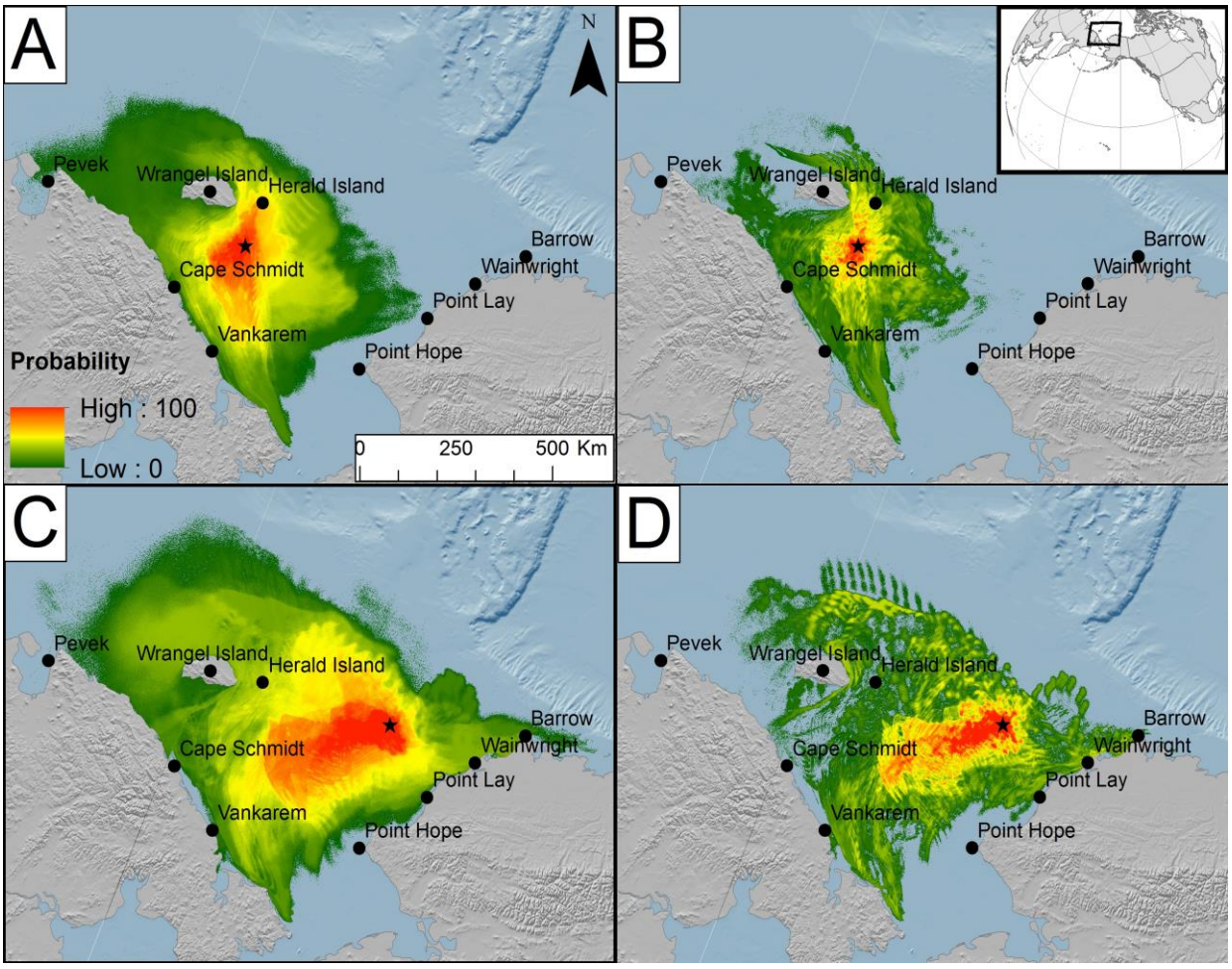


Figure 5. Maps depicting the probabilities of medium (i.e., ≥ 1.0 g/m2) and high density oil (i.e., ≥ 10.0 g/m2) reaching different regions of the Chukchi Sea after a 30 day underwater blowout monitored for a 76 day period; medium density oil from Wrangel (A) and Crackerjack (C) spill sites, high density oil from Wrangel (B) and Crackerjack (D) spill sites. Each spill site is depicted with a star.

Five-Year Review: Endangered Species Act

Under the ESA, the Service is required to review the status of each federally listed species every five years to evaluate whether the species should be delisted or reclassified. In 2017, the Service completed a review for polar bears and concluded that polar bears should remain listed as "threatened" and recommended no status change at this time. For more information, please contact Charlie Hamilton.

International Coordination

The first formal efforts to coordinate polar bear conservation internationally occurred in 1973 when representatives from the five countries that are responsible for managing the world's 19 subpopulations of polar bears, hereafter referred to as the Range States, signed the *Agreement on the Conservation of Polar Bears* (*1973 Agreement*), largely in response to concerns regarding unregulated and unsustainable sport harvest. The *1973 Agreement* calls for cooperative international management and protection of polar bears, and for each country to manage polar bears within their respective jurisdictions, in accordance with sound conservation practices based on the best scientific data available. Recognizing the cultural importance of polar bears to indigenous people, the *1973 Agreement* also allows for traditional harvest of polar bears by local people using traditional methods. Additionally, the IUCN Polar Bear Specialist Group (PBSG), consisting of polar bear experts from each Range State, was formed and began meeting at regular intervals to exchange information and address mutual conservation and management concerns; the PBSG serves as an advisory body to the Range States.

In 2009, the Ranges States identified sea ice loss as the most important contemporary threat facing polar bears world-wide, and began developing a circumpolar plan to address this and other emerging polar bear conservation issues. In 2015, a ten-year plan known as the *Circumpolar Action Plan: Conservation Strategy for the Polar Bear* (*CAP*) was adopted by all Range States to foster international cooperation for securing the range-wide persistence of polar bears in the wild that represent the genetic, behavioral, and ecological diversity of the species. Seven key threats to polar bear conservation are identified in the CAP; of these, human-induced climate change and the effects of such changes on habitat and prey is considered the primary threat. The other threats are: human-caused mortality; mineral and energy resource exploration and development; contaminants and pollution; shipping; tourism-related activities; and disease. The CAP set forth a comprehensive list of actions and commitments laid out in two-year implementation plans, and several working groups were formed to begin implementation of the CAP.

Since 2015, several Polar Bear Program staff have participated on CAP working groups to facilitate implementation of conservation actions in the U.S. One key Service-supported accomplishment was the development of a range-wide Polar Bear Human Incident Management System that allows human-bear conflict data to be consistently collected, housed, and analyzed among the Range States users (Conflict Working Group). Progress by all Range States on the first (2015-2017) CAP implementation plan was reviewed at the Range States meeting held in Fairbanks, Alaska in February 2018. During the meeting, the Range States also adopted a subsequent implementation plan for 2018-2020.

In 2017, a Range States website was developed to serve as a communication platform for the CAP. Please visit www.polarbearagreement.org to find detailed information about the history and work of the Range States, progress of CAP implementation, and more. For more information, please contact Jim Wilder.

Technical Reports and Peer Reviewed Publications in 2017

French-McCay, D., R. Balouskus, J. Ducharme, M. Schroeder Gearon, Y. Kim, S. Zamorski, Z. Li, J. Rowe, C. Perham, and R. Wilson. 2017. Potential exposures of wildlife to oil from hypothetical discharges in the Chukchi and Beaufort Seas. Proceedings of the 40th AMOP Technical Seminary on Environmental Contamination and Response. Environment Canada, Ottawa, Canada.

Regehr, E.V., R.R. Wilson, K.D. Rode, M.C. Runge, and H. Stern. 2017. Harvesting wildlife under climate change: an improved modeling and management framework for polar bears. Journal of Applied Ecology 54:1534-1543.

Rode, K.D., R.R. Wilson, D.C. Douglas, V. Muhlenbruch, T.C. Atwood, E.V. Regehr, E. Richardson, N. Pilfold, A. Derocher, G. Durner, I. Stirling, S. Amstrup, M. St. Martin, A. Pagano, E. Peacock, and K. Simac. 2017. Spring fasting behavior among polar bears provides and index of ecosystem productivity. Global Change Biology. doi: 10.1111/gcb.13933

Wilder, J.M., D. Vongraven, T. Atwood, B. Hansen, A. Jessen, A. Kochnev, G. York, R. Vallender, D. Hedman, and M. Gibbons. 2017. Polar bear attacks on humans: implications of a changing climate. Wildlife Society Bulletin 41: 537–547. doi:10.1002/wsb.783.

Wilson, R.R., E.V. Regehr, M. St. Martin, T.C. Atwood, L. Peacock, S. Miller, and G. Divoky. 2017. Onshore ecology of polar bears in relation to sea-ice loss with implications for the management of conflict with humans. Biological Conservation 214:288-294.

Wilson, R.R., Perham, C., French-McCay, D.P. and Balouskus, R., 2018. Potential impacts of offshore oil spills on polar bears in the Chukchi Sea. Environmental Pollution, 235, pp.652-659.

Staff Contact Information

Several changes to the Ecological Services and Marine Mammals Management programs have occurred over the last two years. Current staff contact information is shown in Table 3.

Table 3. U.S. Fish and Wildlife Service's Marine Mammals Management Office and Ecological Services staff contact information, Anchorage, Alaska.

Name	Title	Phone	Email
Marine Mammals Management Office			
Patrick Lemons	Chief	(907) 786-3668	patrick_lemons@fws.gov
Charles Hamilton	Special Assistant	(907) 786-3804	charles_hamilton@fws.gov
James Wilder	Lead, Polar Bear Program	(907) 786-3913	james_wilder@fws.gov
Susanne (Susi) Miller	Biologist, Polar Bear Program	(907) 786-3828	susanne_miller@fws.gov
Michelle St. Martin	Biologist, Polar Bear Program	(907) 786-3857	michelle_stmartin@fws.gov
Ryan Wilson	Biologist, Polar Bear Program	(907) 786-3830	ryan_r_wilson@fws.gov
Bridget Crokus	Biologist, Polar Bear Program	(907) 786-3378	bridget_crokus@fws.gov
Christopher Putnam	Lead, Regulatory Program	(907) 786-3844	christopher_putnam@fws.gov
Brad Benter	Biologist, Regulatory Program (Marking, Tagging, Reporting)	(907) 786-3980	brad_benter@fws.gov
Ecological Services (oversight for Marine Mammals Management Office and other USFWS field offices)			
Mary Colligan	Assistant Regional Director	(907) 786-3505	mary_colligan@fws.gov
Jenifer Kohout	Deputy Assistant Regional Director	(907) 786-3687	jenifer_kohout@fws.gov